

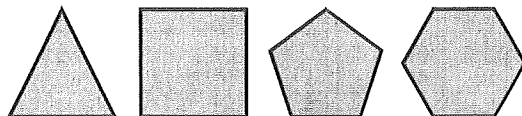
1.1

Finding and Describing Patterns

Goal Find patterns and use them to make predictions.

Example 1 Describe a Visual Pattern

Describe a pattern in the figures.



Solution

Notice that the number of sides increases. Write the number of sides each figure has. Look for a pattern.



3

4

5

6

Answer The number of sides increases by one.

Follow-Up

Make up your own visual pattern and describe it.

Sample answer:



The pattern is square, circle, circle, ... These three figures repeat.

Example 2 Describe a Number Pattern

Describe a pattern in the numbers.

a. 3, 6, 9, 12, 15, 18, ...

b. 1, 4, 9, 16, 25, 36, ...

Solution

a. Notice that the numbers increase. Find the difference between each number and the previous number.

First pair: $6 - 3 = \underline{3}$

Second pair: $9 - 6 = \underline{3}$

Third pair: $\underline{12} - \underline{9} = \underline{3}$

Fourth pair: $\underline{15} - \underline{12} = \underline{3}$

Fifth pair: $\underline{18} - \underline{15} = \underline{3}$

Answer Each number is 3 more than the previous number.

b. Notice that the numbers are perfect squares. For each number in the pattern, write the number that is squared.

| Pattern | 1 | 4 | 9 | 16 | 25 | 36 |
|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Number Squared | $(\underline{1})^2$ | $(\underline{2})^2$ | $(\underline{3})^2$ | $(\underline{4})^2$ | $(\underline{5})^2$ | $(\underline{6})^2$ |

Answer The numbers are squares of the counting numbers 1, 2, 3, 4, 5, 6, ...

Follow-Up

If the numbers in a pattern increase, must they increase by a constant amount? Explain.



No. They can increase by different amounts, as in Example 2, part (b).

Make up your own number pattern and describe it.

Sample answer: 10, 8, 6, 4, 2, ...

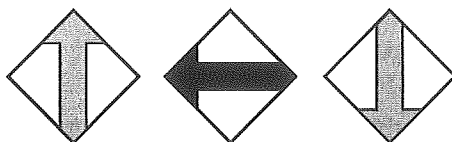
Each number is 2 less than the previous number.

✓ **Checkpoint** Describe the pattern.

| | |
|---|--|
| <p>1. </p> <p>The circle is divided into 2, 3, 4, ... equal parts.</p> | <p>2. </p> <p>The shaded triangle of the sun moves one position counterclockwise each time.</p> |
| <p>3. 4, 8, 12, 16, 20, 24, ...</p> <p>Each number is 4 more than the previous number.</p> | <p>4. 35, 30, 25, 20, 15, 10, ...</p> <p>Each number is 5 less than the previous number.</p> |

Example 3 *Make a Prediction*

Sketch the next figure you expect in the pattern.

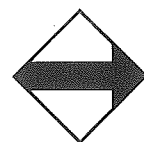


Solution

First notice how the shading changes. The color of the arrow changes back and forth between gray and black. The arrow in the next figure should be black.

Also notice how the direction of the arrow changes. The arrow makes a quarter turn each time. In the next figure, the arrow should point to the right.

Draw the next figure in the pattern.



Example 4 *Make a Prediction*

Write the next two numbers you expect in the pattern.

a. 5, 7, 9, 11, ...

b. -1, 3, -9, 27, ...

Solution

a. Notice that the numbers increase by 2 each time.

When you add 2 to 11, you get 13. When you add 2 to 13, you get 15.

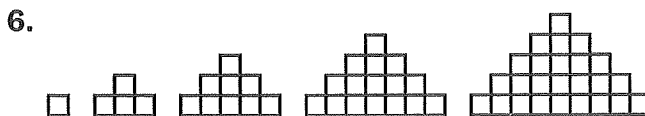
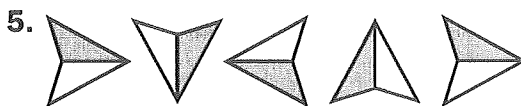
Answer The next two numbers in the pattern are 13 and 15.

b. Notice that the numbers switch from negative to positive in the pattern. This occurs when you multiply by a negative number. Each number in the pattern is -3 times the previous number.

When you multiply 27 by -3, you get -81. When you multiply -81 by -3, you get 243.

Answer The next two numbers in the pattern are -81 and 243.

✓ **Checkpoint** Sketch the next two figures you expect in the pattern.



Write the next two numbers you expect in the pattern.

7. -2, -5, -8, -11, ...

-14, -17

8. 4, 8, 12, 16, ...

20, 24